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Title: Facility Measurements

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Facility Measurements

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4/23/2012

Measurements are the basis of accounting for inventories and transfers and provide assurance that no nuclear material is missing. They provide information on quantities, isotopic composition and weight percent determination of nuclear material in given locations which is essential to determining category levels and protection requirements.

Los Alamos National Laboratory (LANL) uses confirmatory and verification measurements to meet DOE requirements when moving or processing material on External Receipts, External Shipments, Internal Transfers, Processing, and Physical Inventories. This presentation provides details on what type of measurement is required based on several factors. These factors include but are not limited to Category of the Material, application of Tamper Indicating Devices (TID), application of the measurement, and graded safeguards. These elements are part of the overall MC&A program required to effectively control and account for nuclear materials.

LANL depends on multiple organizations to take the measurements and monitor the controls of instruments required to have an effective program. The MC&A group does oversight and control of all standards and instruments. The NDA group manages the day-to-day measurement control activities and does NDA measurements while the operations people use balances in their day-to-day processing.

Confirmatory and Verification measurements are used throughout the nuclear material life cycle to verify inventories and detect theft or diversion of nuclear materials.

Facility Measurements

LA-UR

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MC&A Overview

MC&A Technologies

Nuclear Material Accountability System

Objective: Track Inventory and History of items

Issues: Bulk vs Item
Material Balance Report

Results: Reports (local, national, international)
Amount and location of each item

Facility

Inventory Difference

Objective: Determine inventory difference for a process or MBA

Issues: Data entry errors
Hold up measurements
Historical information for process

Results: Inventory Difference

Physical Inventory

Objective: Verify book inventory

Issues: Frequency of inventories
Sampling Plan
Measurements of inventories
TIDS

Results: Reports (local, national, international)
Reconciliation

Measurement Control

Objective: Record and calculate measurement accuracy and precision before actual measurement

Issues: Data entry errors
Historical information

Results: Automated Go/No go user output

Evaluate Inventory Difference

Objective: Use data from Accounting System and Measurement Control System to calculate combined uncertainties for a process or MBA

Issues: Measurement Uncertainty
Material Type (Matrix)
Holdup

Results: Inventory Difference

LANL Measurement Organizations

Measurement Types

- External Receipts
- Internal Transfers
- Processing
- Physical Inventory
- External Shipments

External Receipts

- **Category I or II**

- Transfer Check (ID, Count of items, TID, Packaging)
- Shipper Receiver Agreements (SRA)
 - Measurement may or may not be required
- If Intrinsic
 - Confirmation Measurement required
- If not Intrinsic
 - Verification Measurement required

- **Category III or IV**

- Transfer Check
 - Shippers Value or Confirmation Measurement

External Receipts

Internal Transfers

- **If movement between Facilities (Material Access Areas)**
 - Transfer Check
 - Confirmatory Measurement required
- **If movement in the facility**
 - Transfer Check
 - No Confirmatory Measurement required

Internal Transfers

Processing

- Material going into and out of a process has to be at a known measurement.
- Intermediate processing steps may also required certain types of measurements (Key measurement points).
- These are used in the calculation of Inventory Difference.

Processing

▪ Mix

▪ Split

▪ Adjustment

Process Monitoring Flow Diagrams

UNCLASSIFIED

Physical Inventory

- **Physical Inventory Checks (Location, Label, TID, ...)**
- **If material is measured and TID'd**
 - Random statistical sample
- **If material is not measured**
 - Verification measurement required

Physical Inventory

External Shipments

- **If material has a Defensible Measurement and SRA is used**
 - No Measurement required
- **If material does not have a Defensible Measurement and no SRA is used**
 - Verification Measurement required

External Shipments

Summary

- Different types of measurements based on need and graded safeguards
- Different type of instruments based on need, cost, and graded safeguards
- Surveillance and control of material reduce re-measurements